

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-25 (Cancelled)

26. (New) A production method for an organic-silica complex membrane having a sulfonic acid group, comprising:

obtaining a sulfonic acid derivative by allowing an alkoxysilane compound having an amino group to react with a cyclic sultone; and

subjecting the sulfonic acid derivative to a condensation reaction.

27. (New) A production method for an organic-silica complex membrane having a sulfonic acid group, comprising:

obtaining a sulfonic acid derivative by allowing a secondary or tertiary amine derivative which is obtained by allowing an alkoxysilane compound having an amino group to react with a compound having at least 2 epoxy groups in a molecule to react with a cyclic sultone; and

subjecting the sulfonic acid derivative to a condensation reaction.

28. (New) A production method for an organic-silica complex membrane having a sulfonic acid group, comprising:

obtaining a sulfonic acid derivative by allowing a secondary or tertiary amine derivative which is obtained by allowing an alkoxysilane compound having an epoxy group to react with an amine compound having at least 2 amine valences (number of hydrogen atoms originated in an amino group contained in one molecule) to react with a cyclic sultone; and
subjecting the sulfonic acid derivative to a condensation reaction.

29. (New) A production method for an organic-silica complex membrane having a sulfonic acid group, comprising:

obtaining a sulfonic acid derivative by allowing a secondary or tertiary amine derivative which is obtained by allowing an alkoxysilane compound having an amino group to react with an alkoxysilane compound having an epoxy group to react with a cyclic sultone; and

subjecting the sulfonic acid derivative to a condensation reaction.

30. (New) The production method as set forth in Claim 26, wherein the alkoxysilane compound having an amino

4
5



group;

ethyl group;

ethyl group, an allyl group, a phenyl group or an organic

hydroxyethyl group;

R⁵ represents a 3-(N-phenylamino)propyl group, a 3-(4,5-dihydroimidazolyl)propyl group or a 2-[N-(2-aminoethyl)aminomethyl phenyl]ethyl group;

X¹ represents a divalent alkylene having from 1 to 6 carbon atoms;

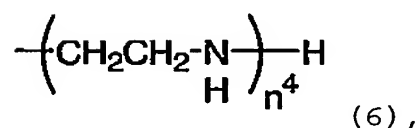
X² represents methylene which is a divalent organic group, oxygen or a secondary amine;

X³ represents a divalent organic group represented by -NH- or -NHCH₂CH₂NH-;

n¹ represents an integer of from 1 to 3;

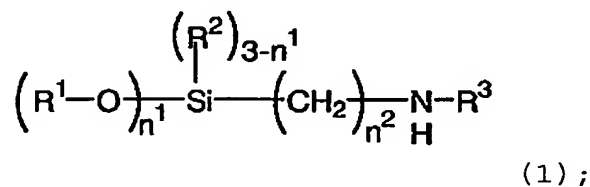
n² represents an integer of from 1 to 6; and

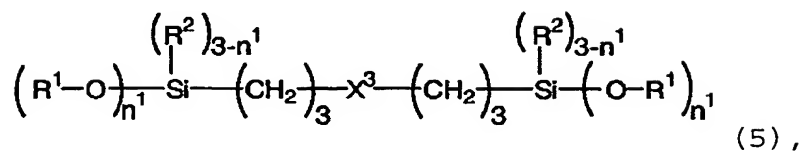
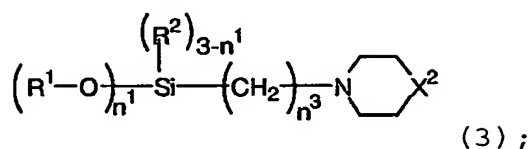
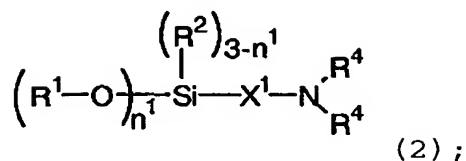
n³ represents an integer of from 1 to 3:



wherein n⁴ represents an integer of from 0 to 2.

31. (New) The production method as set forth in Claim 27, wherein the alkoxysilane compound having an amino group is selected from the group consisting of compounds of formulae (1) to (5):





wherein R^1 represents a methyl group or an ethyl group;

R^2 represents a hydrogen atom, a methyl group or an ethyl group;

R^3 represents a hydrogen atom, a methyl group, an ethyl group, an allyl group, a phenyl group or an organic group represented by the following general formula (6);

R^4 represents a methyl group, an ethyl group or a hydroxyethyl group;

R^5 represents a 3-(N-phenylamino)propyl group, a 3-(4,5-dihydroimidazolyl)propyl group or a 2-[N-(2-aminoethyl)aminomethyl phenyl]ethyl group;

X^1 represents a divalent alkylene having from 1 to 6 carbon atoms;

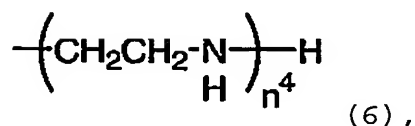
X^2 represents methylene which is a divalent organic group, oxygen or a secondary amine;

X^3 represents a divalent organic group represented by -NH- or -NHCH₂CH₂NH-;

n^1 represents an integer of from 1 to 3;

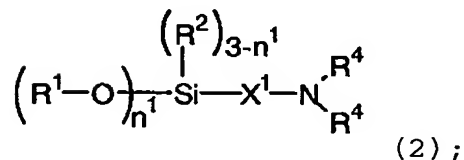
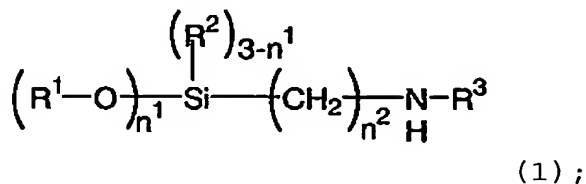
n^2 represents an integer of from 1 to 6; and

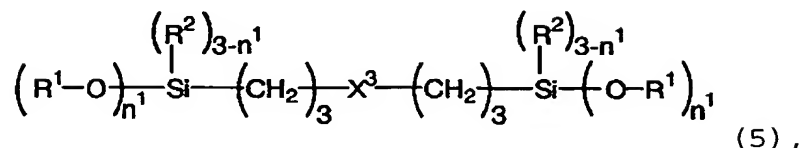
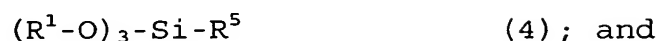
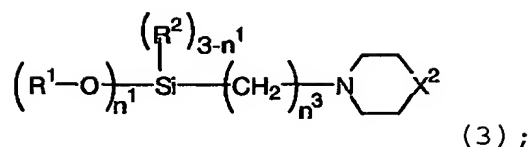
n^3 represents an integer of from 1 to 3:



wherein n^4 represents an integer of from 0 to 2.

32. (New) The production method as set forth in Claim 29, wherein the alkoxysilane compound having an amino group is selected from the group consisting of compounds of formulae (1) to (5):





wherein R^1 represents a methyl group or an ethyl group;

R^2 represents a hydrogen atom, a methyl group or an ethyl group;

R^3 represents a hydrogen atom, a methyl group, an ethyl group, an allyl group, a phenyl group or an organic group represented by the following general formula (6);

R^4 represents a methyl group, an ethyl group or a hydroxyethyl group;

R^5 represents a 3-(N-phenylamino)propyl group, a 3-(4,5-dihydroimidazolyl)propyl group or a 2-[N-(2-aminoethyl)aminomethyl phenyl]ethyl group;

X^1 represents a divalent alkylene having from 1 to 6 carbon atoms;

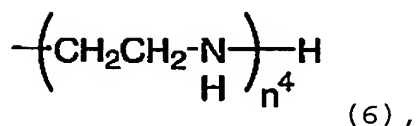
X^2 represents methylene which is a divalent organic group, oxygen or a secondary amine;

X^3 represents a divalent organic group represented by
-NH- or -NHCH₂CH₂NH-;

n^1 represents an integer of from 1 to 3;

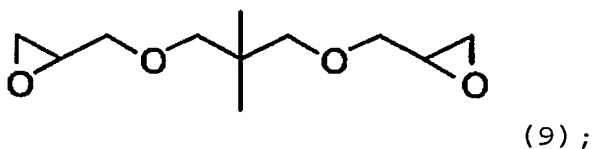
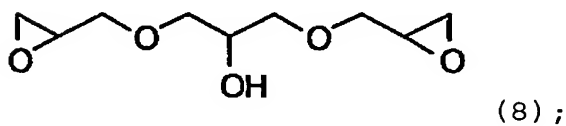
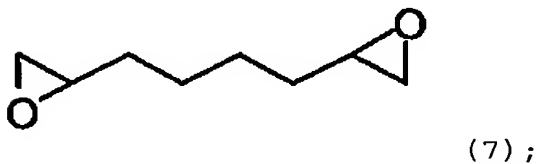
n^2 represents an integer of from 1 to 6; and

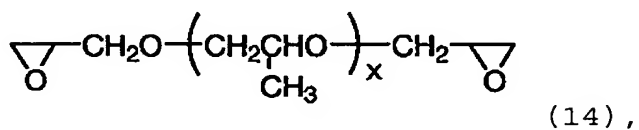
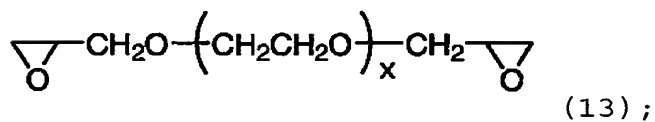
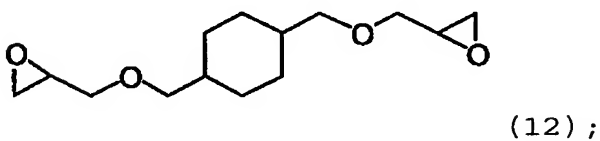
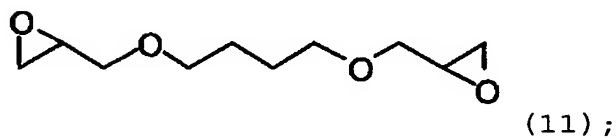
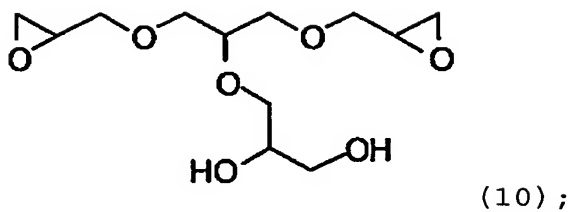
n^3 represents an integer of from 1 to 3:



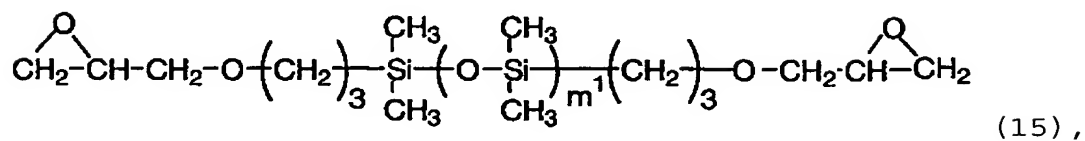
wherein n^4 represents an integer of from 0 to 2.

33. (New) The production method as set forth in Claim 27, wherein the compound having at least 2 epoxy groups in a molecule is selected from the group consisting of compounds of formulae (7) to (28):

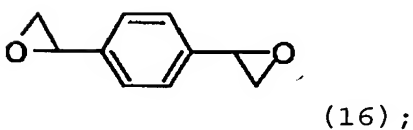


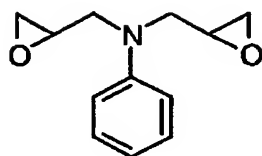


wherein x represents an integer of from 1 to 1000;

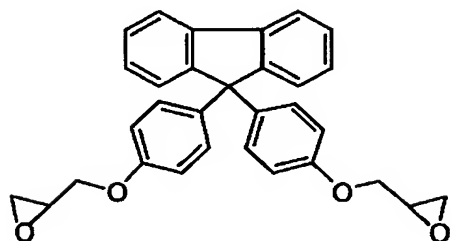


wherein m^1 represents an integer of from 1 to 100;





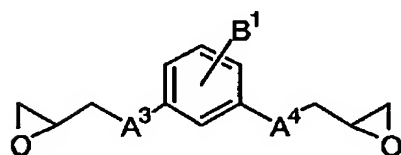
(17);



(18);



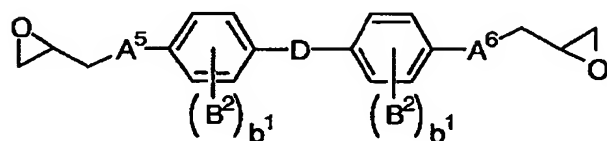
(19);



(20),

wherein A^1 , A^2 , A^3 and A^4 each independently represents a divalent linking group selected from among $-O-$, $-C(=O)O-$, $-NHC(=O)O-$ and $-OC(=O)O-$; and

B^1 represents any one of substituents: $-H$, $-CH_3$ and $-OCH_3$;



(21),

wherein A^5 and A^6 each independently represent a divalent linking group selected from among $-O-$, $-C(=O)O-$, $-NHC(=O)O-$ and $-OC(=O)O-$;

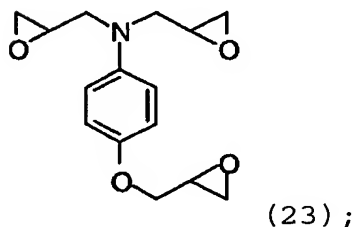
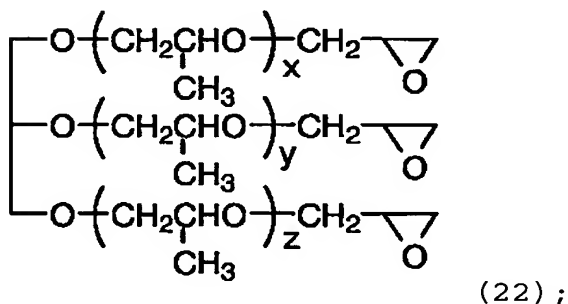
B^2 represents any one of substituents: $-H$, $-CH_3$ and $-OCH_3$;

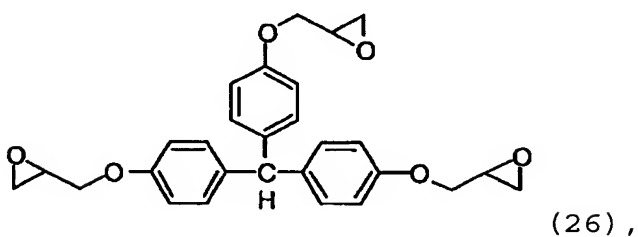
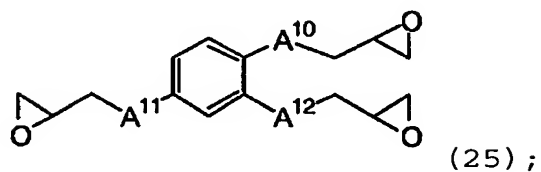
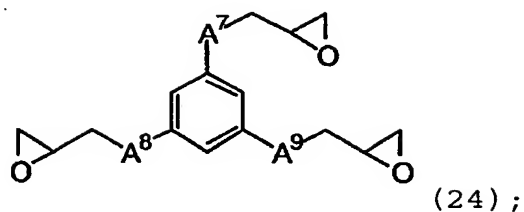
b^1 represents an integer of from 0 to 4;

D represents a single bond or any one of divalent linking groups: $-O-$, $-C(=O)-$, $-C(=O)O-$, $-NHC(=O)-$, $-NH-$, $-N=N-$, $-CH=N-$, $-CH=CH-$, $-C(CN)=N-$, $-C\equiv C-$, $-CH_2-$, $-CH_2CH_2-$, $-CH_2CH_2CH_2-$, $-C(CH_3)_2-$ and the general formulae: $-O-(CH_2)_m-O-$ and $-O-(CH_2CH_2O)_n-$,

wherein m represents an integer of from 2 to 12; and

n represents an integer of from 1 to 5;

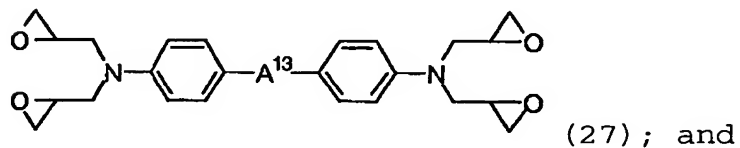


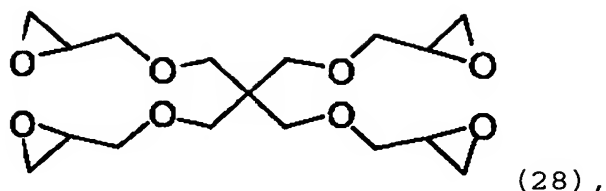


wherein x, y and z each independently represent an integer of from 1 to 20;

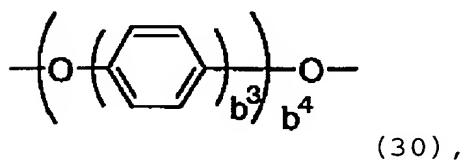
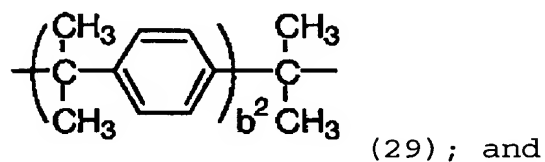
A⁷, A⁸ and A⁹ each independently represents a divalent linking group selected from among -O-, -C(=O)O-, -NHC(=O)O-, and -OC(=O)O-; and

A¹⁰, A¹¹ and A¹² each independently represents a divalent linking group selected from among -O-, -C(=O)O-, -NHC(=O)O- and -OC(=O)O-;





wherein A¹³ represents methylene or a linking group represented by any one of the following general formulae (29) and (30):

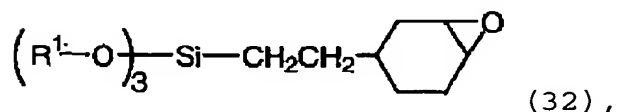
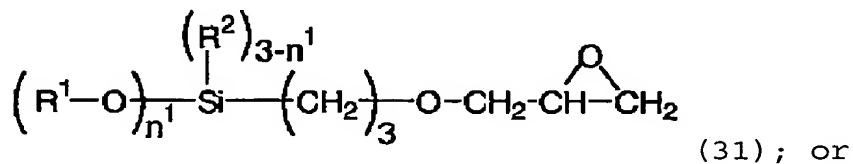


wherein b² represents an integer of from 0 to 4;

b³ represents an integer of from 1 to 3; and

b⁴ represents an integer of from 0 to 2.

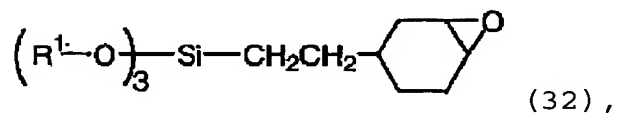
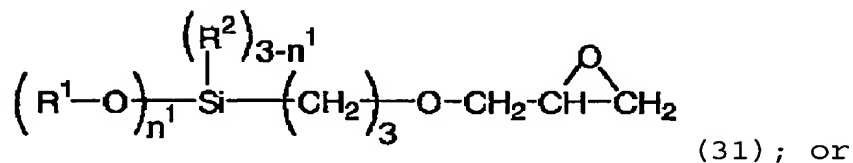
34. (New) The production method as set forth in Claim 28, wherein the alkoxy silane compound having an epoxy group is a compound of formula (31) or (32):



wherein R^1 and R^2 each independently represents a methyl group or an ethyl group; and

n^1 represents an integer of from 1 to 3.

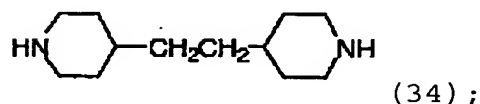
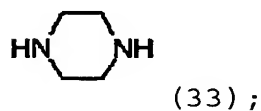
35. (New) The production method as set forth in Claim 29, wherein the alkoxysilane compound having an epoxy group is a compound of formula (31) or (32):

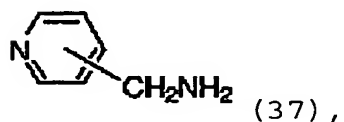
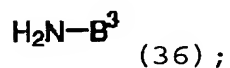
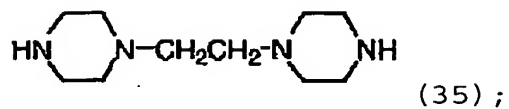


wherein R^1 and R^2 each independently represents a methyl group or an ethyl group; and

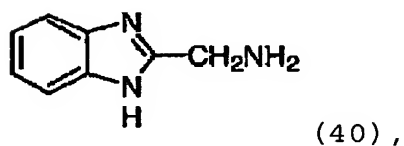
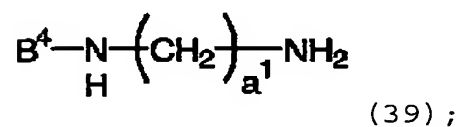
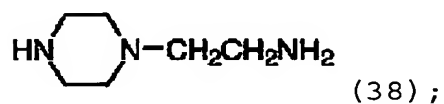
n^1 represents an integer of from 1 to 3.

36. (New) The production method as set forth in Claim 28, wherein the amine compound having at least 2 amine valences is selected from the group consisting of compounds of formulae (33) to (51):



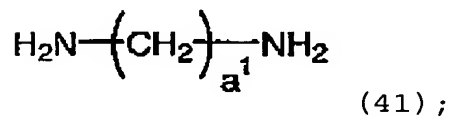


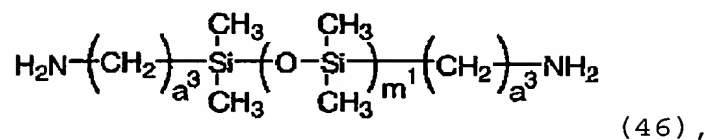
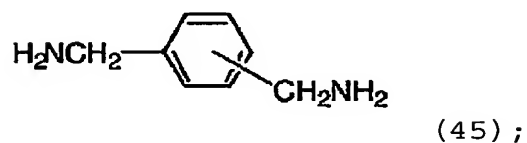
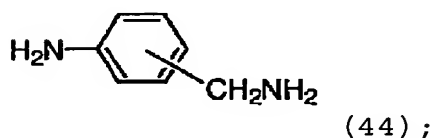
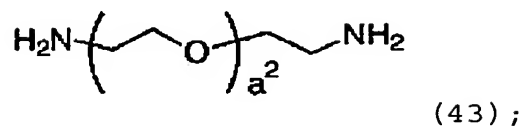
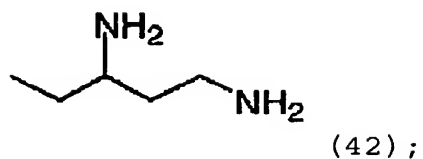
wherein B^3 represents a hydrocarbon group having from 2 to 18 carbon atoms or a group having at least one ether bond in a hydrocarbon chain;



wherein a^1 represents an integer of from 2 to 18;

B^4 represents a hydrocarbon group having from 1 to 18 carbon atoms or a group having at least one ether bond in a hydrocarbon chain;



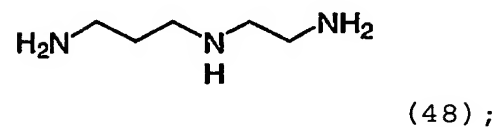
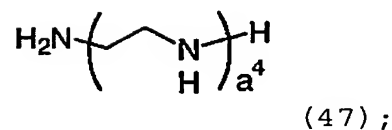


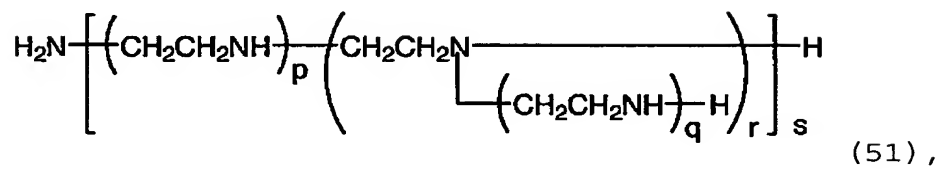
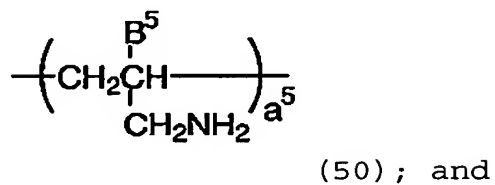
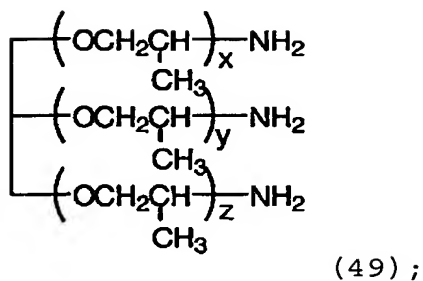
wherein a^1 represents an integer of from 2 to 18;

a^2 represents an integer of from 1 to 10000;

m^1 represents an integer of from 1 to 100; and

a^3 represents an integer of from 3 to 18;





wherein a^4 represents an integer of from 2 to 100;

x , y and z each independently represents an integer of from 1 to 20;

a^5 represents an integer of from 2 to 1000;

B^5 represents hydrogen or a methyl group; and

p , q , r and s each independently represents an integer of from 1 to 20.